ART. VI.—CEREBRAL HYPERÆMIA.

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THE brain, like the other organs, is composed or built up of certain elementary parts; viz., the cell element, or the proper structure of the organ; the vascular element which includes the fluids conveyed to and from it; the residuary or intercellular fluid and the channels of conveyance to and from the organ; and thirdly, the nervous element by which it is brought into co-ordinate relation with the rest of the body; only, as in the brain the cell element includes the nervous element, the brain being its own nerve, this element has to be examined from two separate standpoints.

In the other organs the result of their function is expressed in a material form, and this expression is therefore capable of substantive analysis; in the brain, the result of its function has only a dynamic form, and is therefore incapable of any such analytical inquiries.

By way of comparison, the disorders of the liver may be classified as first, disorders originating in intrinsic disturbance of its cell element, whether of the proper hepatic cells or of its connective tissue matrix. Secondly, disorders originating in disturbance of its vascular element, whether of the blood, of the intercellular fluid, of the lymph, of the blood vessels, or of the lymphatics. Thirdly, disorders originating in disturbance of its nervous element, whether this arise within itself or be reflected upon it from some other organ. Fourthly, accidental disorders, whether produced by foreign bodies, pressure, traumatisms, and the like.

In this arrangement the results of disorder of its function, such as of the bile, sugar, etc., therein produced, are lost sight of primarily, as such disorder is only a consequence of some disorder in one or other of its primary elements, because their very existence is a secondary result of the previous existence of these other parts; while as a similar disorder of function may be the result of primary disorder in either one of its elementary parts, attention becomes directed to actual pathological states, and not to mere symptomatic appearances, Thus the hepatic cells may of their own intrinsic action secrete an abnormal bile or sugar, abnormal either in quality or quantity; or they may be necessitated to such abnormal action by some disorder in the vascular element, such as quantity or quality of blood, conditions of the channels of conveyance, or some other; or they may be necessitated to such abnormal action by some disorder in the nervous element, whether this originate in the organ itself, or be reflected from some distant organ; or they may be necessitated to such abnormal action by accidental causes, such as mechanical or traumatic violence, producing pressure, injury, or the like, under which may be included foreign bodies, gall stones, enlarged glands in the vicinity, visceral distentions, etc., etc. Now it is evident that to restore permanently the normality of function to the hepatic cells, the cause of disorder must be removed; and it is also evident that in these different conditions very different medication is necessary, while under a failure to discover the pathological condition, the medication might lead to disastrous results, if not to death itself.

Let us transfer this plan of classification of morbid states to the brain. We have: First, disorders originating in its cell element, which include all degenerations of vesicular cells, of nerve fibres, and of neuroglial cells, commencing as original processes. Secondly, disorders originating in its vescular element, which include miliary and other aneurisms, thrombosis, embolism, hyperæmia, anæmia, overflow of lymph channels or serous appoplexy, all forms of toxæmia, and all abnormal conditions of the blood itself. Thirdly, disorders originating in its nervous element, which include all the disturbances in the functions of the nerve cells and fibres, whether central or reflex, that are not produced as secondary results from disorder originating in the other elements. Fourthly, troubles originating in consequence of mechanical or traumatic injury, as from disorders of the envelopes hard and soft, concussion, contusion, cysticerci, etc., etc. In this arrangement the results of disorder of its function, such as insanity or disorders of ideation, spasm, convulsion, paralysis, or disorders of motion, and disorders of sensation, are lost sight of as primary morbid conditions, because such disorders are only a consequence of some disorder in one or other of its primary elements; ideation, motion, and sensation being secondary results of the previous existence of those parts; and it is only by such disordered manifestations that we become cognizant of trouble existing in these primary elements; they being the symptoms of such disorder, just as palpitation, cough, or vomiting are indications of derangement of the various organs manifesting such symptoms. No one would say that palpitation, cough, or vomiting are substantive realities; they are merely modes of action, abnormal in their manifestation; in the same way insanity and disorders of ideation, spasm, convulsion, and paralysis, and disorders of motion, and disorders of sensation are not substantive realities, they are merely modes of action, abnormal in *their* manifestation; and, if the abnormal condition of ideation is not a substantive reality, the normal condition of ideation cannot be a substantive reality, it also is only a mode of action, but is normal in its manifestation. Thus it is high time that the word "mind," (which is the same as ideation), be no longer employed to express a substantive reality, any more than we should express a substantive reality by the term "rhythm of the heart."

We may speak of mental disorder as we say pulmonary disorder or cardiac disorder; only in the first we expressly designate the particular mode in which the cerebral disease is manifesting itself, as in the two latter we may speak of cough or palpitation. We speak of them, it is true, as morbid conditions, but really we mean they are symptoms of morbid conditions; so when we say a person has a cough, or is troubled with palpitation, we mean exactly the same as when we say a person is insane, we express the prominent symptom in each case, but not the true morbid condition.

The function of the brain (nerve centers) consists in the correlation of the force of the external world into that particular mode of force known as nerve-force, which may be manifested either as sensation, ideation, or motion, according to the particular cells involved in the correlation. To perform this function properly the cells, (neurine) require a certain nutritive condition, the result of definite relations between them and the blood. In a former paper it was attempted to explain why a lack of blood, and consequently a disturbance of these relations gives rise to phenomena, apparently identical with those produced by an excess of blood. In the present paper some of the phenomena of the latter, that is, of hyperæmia, will be examined, especially those lying in the borderland between the physiological and the pathological states.

The first point to which allusion will be made, is dilatation of the arterioles from paresis of their vaso-motor nerves. These nerves are derived from the sympathetic; and as for a very considerable period in medical history, the sympathetic nervous system has been considered by some as an entirely different system from the cerebro-spinal, we find a constant tendency to attribute some morbid conditions to especial morbid changes in this system as an independent organ; while some have considered this system as the dominant source of nervous power in the body, and therefore attribute nearly all diseases to disturbances of its condition.

To complete the electric circuit, we need, first, the battery in which the electricity is generated; secondly, the body into which the electricity is to be discharged or stored up; thirdly, an efferent wire from the first to the second; fourthly, an efferent wire from the second to the first. If only one wire be extended from the first to the second, so no substitute for the second wire be employed, there will not be any passage of the electric current, however freely electricity may be developed. In the body we have the same conditions—the electricity is developed throughout its whole periphery—the efferent nerves convey it tò the brain; then it is correlated, equivalent to discharged, efferent nerves to the periphery complete the circuit. Efferent nerves pass to the brain (and cord), and they are various in kind. Efferent nerves pass from the brain (and cord), and they also differ in kind; the sympathetic nerves forming one of these varieties.

Paresis of vaso-motor nerves may therefore arise from various cerebral conditions; such as forms of emotion, overwork, central diseased conditions, toxic agents, reflected diseased conditions.

The second point to be examined is physiological hyperæmia from increased action of the brain itself. One person commences the pursuit of blacksmithing, another ballet dancing—by the influence of the will they put certain series of muscles into unwonted activity; their tissue waste is increased, their blood circulation is increased, their nutrition is increased, their functional power is increased. A third person commences to study, by the influence of his will he puts certain series of cortical brain cells into unwonted activity; their tissue waste is increased, their blood circulation is increased, their nutrition is increased, their functional power is increased.

It should ever be borne in mind that the brain is only a part of the body, and is subject to the same laws as the rest of the body, both in its healthy and in its morbid conditions. If the blacksmith overworks, if the ballet dancer over-dances, paralysis of their overworked muscles and subsequent atrophy may be the result; if the student overstudy the same effect may be produced. But from the peculiar histological structure of the brain, in another that complex condition known as inflammation may be produced; while in another the excessive discharge of nerve force in study may so reduce the activity of the nerve centres, that the arterioles do not contract from actual deficiency of nerve force sufficient to enable their muscular coats to overcome the dilating influence of the blood current passing through them.

The next point is, hyperæmia resulting from alcoholic drink in small quantity. Increase of oxidation may be produced by increasing the supply of oxygen, or by increasing the supply of easily oxidized material. Under the usual somatic conditions when alcohol is absorbed into the blood, it rapidly becomes oxidized, and thus saves the tissues from oxidation or waste. This rapid oxidation and liberation of force, accelerates the somatic processes, and part of the force thus largely liberated becomes used up at once in increased ideation. Another part is used up as increased motion, and this produces an increase in the heart's action, and a corresponding degree of increase in the circulation throughout the body; in which the brain, receiving a supply equal to one-fifth of the total volume of blood circulated, has its circulation much more largely increased than is the circulation of any other organ; this increase distends the arteries, closes up to a greater degree than normal, the perivascular spaces, and thus increases the results of oxidation in the brain, at the same time that it diminishes the channels for their removal. Under rest, or so-called sleep, the result of the pressure, and therefore very slight coma rather, the circulation becomes re-established in the arteries and the lymphatics, and the alcohol being eliminated, proper tissue waste again occurs, and the functions of the brain cells return to their normal condition.

The balance of the cerebral circulation being maintained by the lymphatics as well as the veins, if the former do not convey away the surplus intercellular fluid (the cerebro-spinal in this organ), which results from the oxidation of hydrogen, whether of the tissues or of the contents of the blood, this fluid accumulates; and as the cranium is a closed cavity with non-distensible walls, and therefore having a speedy limit to its containing capacity, the fluid produces pressure, and thus hinders the arrival of the arterial blood, retards the circulation, and allows the intercellular fluid to pass by osmose into the veins, until the arteries have so contracted as again to leave the perivascular spaces open.

The next form is hyperæmia occurring in the earlier stages of pyrexia, or fever in the exanthemata, before the appearance of the eruption; with it, or just after it, we often have symptoms of cerebral disturbance, delirium, sleeplessness, disturbed dreams, and the like. What is the cause of such symptoms? The disorder is accompanied by a diffusion of inflammatory foci in the skin; in these spots there is an increased tissue change, an increased liberation of force; this is conveyed by efferent nerves to the brain, increased activity of nerve cells is the result; with this comes increase in the blood supply. Then again the increased liberation of force causes acceleration of the circulation and dilatation of the arterioles by the increased volume of the blood current An increase in the urinary secretion, if it can be obtained, will in such cases assist materially; hydragogue catharsis is the next substitute—in some few cases blood-letting, an operation which nature frequently accomplishes by epistaxis. This condition must not be confounded with that form of hyperæmia sometimes met with in advanced stages of fever, in the adynamic or typhoid condition; whether bilious, remittent, typhoid, typhus, or continued (Synochus); as in almost all these the congestion is passive, or venous.

The last point to be adverted to is that form of hyperæmia found in general paralysis of the insane, in which the arterioles are most probably in a state of moderate or slight spasm; they thus at all times contain a larger amount of blood than natural. As this form of disease has generally proved fatal, it has been very fully investigated, and is still being investigated by numerous physicians of lunatic asylums, to whose reports the reader is referred.

The general subject of hyperæmia is sufficiently discussed in the text-books, and if the results of hyperæmia in other organs be transferred, *mutatis mutandis*, to the brain, the results of hyperæmia of this organ will be at once intelligible—vide Hammond and Niemeyer.

ART. VII.—A CASE OF TRAUMATIC TETANUS TREATED WITH LARGE DOSES OF TINCTURE OF ACONITE. RECOVERY.

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I was called September 8th, 1876, to see the son of Thos. Stein, a German, aged 14 years, who had received a wound in the ball of the left foot, made by a manure fork.

The history of the case as obtained from his parents, was that the wound had been made one week previous to the time I was sent for; they had paid but little attention to the child as they did not think the wound serious. On the 6th, two days